

# CERNA (D.)

## The Therapeutic Uses of Sparteine.

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## THE THERAPEUTIC USES OF SPARTEINE.\*

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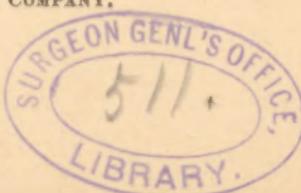
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IN a paper which I had the honor of reading before the Texas Academy of Science last December, I fully discussed the physiological actions of sparteine. From a study of the literature of the subject, and particularly from the results obtained in my experimental research, I have found, in corroboration of previous experimenters, that sparteine, one of the active principles of *Cytisus scoparius* or *Sarothamnus* (?) *scoparius*, or common broom plant, is, not unlike digitalis, a decided stimulant to the general circulation. On the dog, I found that the drug, given hypodermically or intravenously in what may be called therapeutic amounts, acted particularly as a cardiac stimulant, increasing the arterial pressure and the force of the pulse. The rate of the heart beat is at first somewhat accelerated, and is soon followed, however, by a distinct slowness, but the energy of the cardiac contractions is considerably increased, as evidenced by the large size and full-

\* Read before the Texas State Medical Association, at Austin, April 24, 1894.

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ness of the individual pulse waves. This augmented cardiac force is also observed when the drug is applied directly to the batrachian viscera *in situ*, or when the isolated heart of the frog is placed in a sparteine solution, as well as when it is administered subcutaneously to other animals or to man. Large doses cause a fall of the arterial pressure, and even when the column of mercury in the manometer is far below the original height the increased cardiac energy is apt to persist. I have likewise noticed that under poisonous amounts of the agent the heart usually ceases in systole, and generally *after* the stoppage of the respiration, death being therefore produced by failure of the latter function. The drug undoubtedly acts powerfully upon the heart itself, whether on its intrinsic ganglia, or on the cardiac muscle, or on both; it exercises some action on the vaso motor system also. For a fuller consideration of the physiological actions of sparteine on the circulation and on other portions of the animal economy I refer the reader to my previous paper.\*

As a therapeutic agent sparteine is but sparingly spoken of in the text-books. Such a disregard for a useful remedy, it seems to me, is not justifiable. In carefully looking over the literature pertaining to the use of this agent in practical medicine (the largest number of references at my command were kindly furnished me by my former learned teacher, Professor Alfred Stillé, of Philadelphia, to whom I herein wish to express my obligation), I find that it has been tried by a considerable number of clinicians, and generally, as will be seen, with good results. I believe it will be proper for me to give a brief summary of these studies before giving my own experience and that of other gentlemen who have been kind enough to assist me in the matter.

\* *American Medico-surgical Bulletin*, April 1 and 15, 1894.

Sée \* affirms that the drug is valuable in cardiac affections, increasing diuresis; that it is superior to other heart remedies in its ability to control general nervous excitement and in its power to regulate an irregular pulse. In a later observation the same writer comes to regard the medicament as an auxiliary to other cardiac remedies.† The views of Sée in regard to the properties of sparteine as a heart tonic have been confirmed in the main by Buckler,‡ Roland,§ and Voight.|| Foy △ found it as a heart tonic a good substitute for digitalis and convallaria.

Leo ♦ finds that sparteine causes no increase in the amount of urine in healthy individuals. He recommends it in cardiac disease, especially when there is lack of compensation and it is then desired to produce diuresis. On the other hand, Prior ‡ believes that even in health, under certain circumstances, the agent is capable of exercising a diuretic action. He regards it as more useful in valvular lesions than in disease of the cardiac muscle. The same writer tried it in bronchial asthma, but without any good results.

Gluzinski ‡ observed that the medicament slowed the heart's action and increased the arterial pressure. In his opinion, sparteine, though less powerful than digitalis, is more rapid in its action, and therefore may be used when there is danger in delay. He does not believe that spar-

\* *Bull. gén. de thér.*, cix, 523; also *Arch. génér.*, p. 117, January 1886.

† *La Médecine moderne*, July 2, 1891.

‡ *Boston Medical and Surgical Journal*, p. 627, June, 1886.

§ *Le Poitou médical*, 1887.

|| *Medic. Chron.*, April, 1887; also *Med. Record*, xxxiii, 666.

△ *Medical Press and Circular*, xli, 121, 1886.

♦ *Zeit. f. klin. Med.*, xii, 143, 1887.

‡ *Berl. klin. Woch.*, xxiv, 661-666, 1887.

§ *Wratch*, 1887.

teine removes cardiac arrhythmia. A similar opinion has been expressed by Stoessel,\* who considers sparteine inferior to digitalis in cardiac arrhythmia. In his experience, again, the drug exercises no influence in fatty degeneration of the heart, and he further found it without power as a diuretic.

Langgard † has reported eighteen cases of heart disease in which sparteine produced beneficial results, results which have been more or less corroborated by Clarke.‡ This latter observer has arrived at the conclusion that sparteine can be used with advantage in heart disease, particularly hypertrophy, when digitalis is contraindicated. He found in general that the remedy slowed the rate but increased the force of the pulse, causing at the same time a rise of the arterial pressure. The forms of disease treated with sparteine, with the effects produced, are thus specified by Clarke: 1. In mitral regurgitation the results were very striking. 2. In mitral stenosis the benefits were less and less pronounced. 3. In aortic regurgitation, with greatly enlarged and excited heart, small doses were useful. 4. In asthma the influence was good, but very tardy. 5. In palpitation, without organic disease of the heart, the relief was immediate; and, 6. In Graves's disease it occasioned great improvement.

Pawinski § studied the drug very carefully in thirty-three cases, and found that it produced diuresis, no disturbances of digestion, and that it had no cumulative action; that the effects of the remedy became pronounced in from thirty to forty minutes after its ingestion. He

\* *Cent. f. d. ges. Ther.*, v, 163-174, 1887.

† *Ther. Monatshefte*, 1887.

‡ *American Journal of the Medical Sciences*, xciv, 363-371, 1887.

§ *Gaz. Lekarska*, January 7, 14, and 21, 1888; also *Gaz. hebdom. de méd.*, 1888.

also found it serviceable in the functional cardiac disease of neurasthenic and anæmic individuals, and of heavy drinkers and excessive smokers. Similar good results were obtained in asthma, Graves's disease, chronic bronchitis, and emphysema, particularly in those cases in which digitalis was not tolerated. The author, however, warns against the use of the medicament in cases in which the cardiac muscle is believed to have undergone degeneration.

Maslowski \* employed the remedy in three cases of cardiac disease, and found it a rapidly acting and powerful heart tonic and diuretic. In his experience the drug had no cumulative action. Identical observations have been made by Livierato † and Fereira.‡ The latter author obtained excellent results in functional and organic affections of the heart, and further believes sparteine to be of special service in those cases in which digitalis is contraindicated.

Pawlow # thinks that sparteine is only indicated in cases in which compensation is undisturbed, while, on the other hand, Kurloff || believes the remedy only useful in cases where there is lack of compensation without organic lesion—that is, in those cases in which more energetic drugs are contraindicated.

Levaschew △ is of the opinion that sparteine is capable of promptly re-enforcing and controlling a weak and irritable heart. In his hands the remedy has proved successful in steadyng the pulse and the respiration. He, however, has found it powerless in degeneration of the cardiac mus-

\* *Therapeutic Gazette*, January, 1888.

† *Journ. des sciences médicales de Lille*, February, 1888.

‡ *Rev. génér. de clin. et de thérap.*, February 9, 1888.

# *Vratch*, No. 26, 1888.

|| *Archiv f. klin. Med.*, xlv, p. 57, 1889.

△ *Centr. f. Ther.*, vii, 597; also *Amer. Jour. of the Med. Sciences*, 1889.

cle, and again in those cases in which the œdema was excessive. He further observed that in cases of cardiac disease the remedy causes an increase in the amount of urine secreted. Though not asserting the fact, the author has thought that sparteine produced digestive disturbances, and, on the whole, considers the drug inferior to digitalis, adonis, and strophanthus.

L. A. Gluzinski\* found sparteine useful in the first stages of heart failure, and states, further, that the medicament is prompt in its action.

As a diuretic sparteine has rendered good service in the hands of Bruen.† This author, however, believes that the agent has a cumulative action. According to Houdas,‡ sparteine is indicated in lack of compensation and when the myocardium is relaxed, owing to organic changes. Masius # entertains the belief that the drug is unable to act as a diuretic in healthy individuals. Ball and Jennings || have used the medicament in the treatment of the opium habit, with the object of sustaining the heart's action. Tremors have been treated with sparteine by Potts,^ and Evans ♦ has employed the drug in the treatment of angina pectoris.

Tyson reports an obstinate case of dropsy in which sparteine gave excellent results as a diuretic. † Solis-Cohen ‡ states that the remedy is useful as a cardiant diuretic, and even superior to digitalis, especially when combined with caffeine.

\* *Archiv f. klin. Med.*, March 14, 1889.

† *University Medical Magazine*, January, 1889.

‡ *Dosim. Medical Review*, May, 1891.

^ *Times and Gazette*, xi, 403.

|| *Practitioner*, xxxviii, 459; xxxix, 132.

^ *Therapeutic Gazette*, xvi, 368.

♦ *University Medical Magazine*, v, 46.

‡ *Medical News*, June 21, 1890.

† *Ibid.*, March 13, 1893.

Quite recently Bacon \* records a striking case of valvular disease of the heart, following inflammatory rheumatism, in which sparteine acted promptly and effectively. The author affirms to have used the same agent in two cases of mitral disease, with failing compensation and dropsy, with excellent results, and believes it to be one of the most reliable drugs at our command for the relief of such conditions. He has observed that under the action of the medicament the heart's action becomes more regular, and that the daily amount of urine is increased. The same writer reports a second case † of acute endocarditis complicating inflammatory rheumatism, which steadily grew worse under routine treatment. When the heart was intermittent every third beat, with great irregularity, and the radial pulse was hardly perceptible, sparteine was administered in doses of a quarter of a grain every four hours. The effects were noticed in thirty minutes after the first dose, and in two hours the increase of the cardiac force was marked. After the third dose the labored dyspnoea began to lessen and the heart was gaining force; after six hours the pulse ceased to intermit, and in twenty-four hours was nearly regular and quite strong. No ill effects were observed, the patient being a girl eleven years of age.

Though not in a very extended manner, I myself have tried sparteine in practical medicine. Here I have found the drug to act not only as an energetic heart tonic, but also as an excellent diuretic. In the former instance—that is, as a cardiac stimulant—I have employed the remedy, with most satisfactory results, in nervous palpitation, in irritable heart due to excessive use of tobacco, and in that similar condition of the viscera caused by mere muscular weakness or loss of inhibitory power.

\* *American Therapist*, October, 1893

† *Ibid*, April, 1894.

I have observed good effects following the use of the drug not only in functional disorders of the heart, but likewise in valvular affections. In these cases, and much more particularly in those in which digitalis is contraindicated or not well borne, sparteine is highly beneficial, and not perhaps as a curative agent in most instances, but simply as a regulator of the circulation, thereby causing, at least for the time being, a more or less prolonged relief. Again, in dropsies of cardiac origin as well as in those depending on renal disease, the drug under consideration has produced as a diuretic marked results in my hands. The action of sparteine on the circulation is very decided, and it is probably due to a local increase of the arterial pressure in the organ, the result of a general action, that the drug enhances the activity of the kidney, for, so far as has been determined by experimental studies, sparteine possesses no true diuretic virtues like caffeine, for instance, which directly stimulates the renal epithelium.

In breathlessness occurring in obese persons, due probably to a fatty infiltration of the heart, as well as in the shortness of breath of anaemic patients, the employment of sparteine has been followed by decided benefit, and similar results have I observed in cases of bronchitis and in a considerable number of asthmatic individuals.

It may be said, indeed, that the range of usefulness of sparteine is not a limited one, yet the chief service rendered by the drug in the treatment of disease, not only as a substitute for more powerful medicaments belonging to the same class (like digitalis, strophanthus, adonis, convallaria, etc.), but as a prompt cardiac and renal stimulant in itself, is made manifest particularly in those conditions characterized by a weakened circulation due either to functional or to organic changes. The remedy generally relieves and sometimes cures. I have never seen disagreeable, much

less poisonous, effects following the administration of the drug even when ingested in comparatively large quantities, and I may here suggest that the failure of this agent to do good in the hands of some practitioners has been, I believe, chiefly due to the fact that it has not been employed in proper doses or for a sufficient length of time. Probably, on the other hand, the quality of the drug used has been overlooked. I have administered sparteine by the mouth or subcutaneously as the *sulphate*, and in this form it has generally produced the desired effects.

I am so convinced of the stimulating action of sparteine upon the circulation that I fully concur in the opinion of Sée\* in that this drug, as far as our knowledge goes, is superior to all other similar remedies in its ability to steady the most irregular pulse. Hence, as noticed by various observers, chiefly Pawinski,† Clarke,‡ Wood,§ and others, the usefulness of sparteine in such diseases as exophthalmic goitre, in which an irregularity of the cardiac action is a prominent and often most distressing symptom. I myself have treated cases of this latter affection with most striking results, using sparteine to the exclusion of all other heart tonics.

Indeed, next to digitalis, sparteine has been, according to my experience, the most effective stimulant to the circulation, and often has given me more satisfactory results than the former remedy. Sparteine, though less powerful perhaps than digitalis, the prince of cardiac stimulants, has a very decided advantage over the latter agent in that it has no cumulative action. But to illustrate my individual experience in the therapeutic applications of sparteine, I may venture to describe, as briefly as possible, the following

\* *Loc. cit.*

† *Loc. cit.*

‡ *Loc. cit.*

§ *Therapeutics: its Principles and Practice.* Eighth edition, 1891.

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cases, and in so doing I will endeavor to avoid unnecessary details:

*CASE I. Valvular Lesions traceable to Acute Articular Rheumatism.*—F. G., aged thirty-two years, married, no children. Family history apparently good; no syphilis. Patient suffered from infantile disorders such as measles, whooping-cough, etc. At about twenty years of age had a mild attack of typhoid fever, but made a speedy recovery. About six years previous to present illness suffered from articular rheumatism brought on by exposure to cold and dampness. When first seen by me patient had been sick for about three months. Complained of pain in joints and over praecordial region; was dyspnoic; had a temperature of 101° F. (38.3° C.), with slight remissions; pulse, 128 a minute, weak and irregular; respiration, 38; expression anxious. Physical examination revealed, on percussion, an enlarged area of dullness over the cardiac region, and on auscultation, a harsh murmur, apparently diastolic, extending over to carotids; signs of both mitral and aortic regurgitation. Albumin in urine; daily quantity of this fluid about thirty ounces (850 grammes). Insomnia. Patient was placed on a strictly milk diet, etc. Iodide of potassium, quinine, alternating with some of the coal-tar derivatives, carefully watched, were given. No improvement in the course of a month. Patient was then put on the *sulphate of sparteine* exclusively, in doses of a quarter of a grain (0.015 grammes) three times a day. No marked changes occurred in a week. I then increased the dose to half a grain (0.03 grammes) three times a day and resumed the potassium salt. Improvement soon followed. By the end of another week the pulse was steady and strong—98 a minute; respiration, 22; the flow of urine was increased, the fluid measuring from sixty to eighty ounces (1,700 to 2,265 grammes) a day, with a notable diminution in the amount of albumin; bodily temperature, 99° F. (37.2° C.). Patient slept better. The same treatment was continued, and in about a month longer the bodily temperature had regained its normal standard; pain in the joints was almost gone; pulse, 85; respiration, 20; urine free from albumin, and nearly a hundred and seventy ounces (4,815

grammes) in amount in the twenty-four hours; praecordial distress absent. Discharged patient, and in two months he reported himself as still in a comfortable condition, with good appetite, and able to take light exercise in the open air.

*CASE II. Cardiae Dilatation with Lack of Compensation.*—G. V. G., aged fifty-two years, farmer, with good family history. Patient had for some years complained of shortness of breath after slight exertion. Had been advised to stop all physical work. The man was suffering from a chronic mitral lesion. During an attack of influenza his old heart trouble had been much aggravated, but under proper treatment and good nursing he had entered into convalescence from the grippal disease. One afternoon, shortly after partaking of a good meal, the patient became suddenly faint, with a sense of distress over the praecordia, dyspnoea, and a feeling of approaching dissolution. In the course of a few days bronchitis supervened, followed soon afterward by general oedema. When first seen this symptomatology was noticed: Marked cyanosis of the skin; general oedema, pulsation of jugular veins; regurgitant murmurs in mitral and tricuspid regions; intense dyspnoea; pulse feeble, irregular, and rapid, about 140 a minute; respiration, 42; urine scanty and albuminous; insomnia. Diagnosis being apparently clear, patient was given digitalis; but this remedy seemed to aggravate the condition, and was therefore immediately substituted with sparteine in doses of half a grain (0.03 gramme) every three hours. After the fourth dose the patient felt intense relief, his breathing became regular and easy, only 28 a minute; pulse steady, full, and strong, 92 a minute; there was a good flow of urine. The remedy was kept up in doses of half a grain (0.03 gramme) every three hours, and in the course of three weeks, with a gradual improvement of the respiration and the circulation and the renal function, the oedema, the cyanosis, and even the bronchial trouble had practically disappeared. The sparteine was gradually diminished in amount, and the patient continued to do well for a couple of months longer. One day, while attempting to walk upstairs in a hurry, he fell over and in a few minutes died. No autopsy was allowed.

**CASE III.** *Chorea associated with Endocarditis.*—Y. L. M., aged ten years. Patient rheumatic; family history uncertain, but probably also rheumatic. The boy had had scarlatina and measles when quite young, and had suffered from chorea for the last six years. While apparently in good health (except his choreic trouble, for which he had never been treated), after exposure to cold and dampness, he developed a bodily temperature of 105·8° F. (41° C.), accompanied with intense headache and marked dyspnoëic symptoms; coated tongue, thirst excessive, and profuse perspiration. Examination showed almost entire absence of cardiac impulse; precordial pain; weak, irregular, and compressible pulse, 138 a minute; respiration, 42; cyanotic condition of surface of the body; constipation; scanty secretion of urine. On Monday, after moving his bowels with a gentle laxative, patient was put on quinine and salicylates. Wednesday, no apparent improvement as yet: temperature, 102·2° F. (39° C.); respiration, 40 a minute; pulse, 142 a minute and growing weaker and more irregular, sometimes distinctly intermittent; secretion of urine about the same as before. Suspended the quinine, but continued the salicylates. Saturday, a slight improvement was noticed, but the pulse was exceedingly weak and alarmingly rapid, 150 a minute; respiration, 44; temperature, 100·6° F. (38·1° C.); dyspnoëa distressing. The salicylates were now discontinued also and the patient was put on sparteine sulphate, a quarter of a grain (0·015 grammes) every three hours. After the third dose the dyspnoëa became better. On the next day I found decided improvement: patient had passed a good night, and was now breathing a great deal easier; respiration, 32; pulse stronger and more regular, 104 a minute. An increased flow of urine was noticed by attendants, but the quantity was not ascertained. Continued the administration of sparteine in doses of a quarter of a grain (0·015 grammes) three times a day. There was a gradual but decided amelioration, and four days afterward the bodily temperature was about normal; appetite very good; sleep at night also very good; pulse quite strong now, full, and regular, 98 a minute; respiration, 28 a minute; kidneys very active. In a week longer the patient got out of bed. Suspended the sparteine and put

him on a tonic. Several days later the pulse became faster and somewhat irregular, and the patient was given sparteine once more for another week, with the same good results. The effects on the general circulation, particularly the heart, and on the kidneys were distinctly beneficial.

CASE IV. *Exophthalmic Goitre*.—Miss J. del C., aged seventeen years, of a lymphatic temperament; anaemic. Family history good. Menstruated at fifteen, but periods irregular and scanty. Had been suffering from present disease for several months and had been treated unsuccessfully by able physicians with various medicaments and even with electricity. Now she was also troubled with distressing palpitations, dyspnoea, and fainting spells; blushed and perspired under the slightest provocation; digestion bad; bowels, though not constipated, very irregular; insomnia; great nervous depression, with suicidal tendencies. Patient weighed ninety-two pounds. Physical examination showed systolic murmur over the apex; heart sounds feeble. The typical signs of exophthalmic goitre were marked, especially the rapidity of the heart's action, the organ beating from 158 to 170 a minute; prominence of eyeballs and enlarged thyroid glands, with distinct throbings of both carotids; respiration, 38 a minute. I learned that she had taken alternately digitalis, strophanthus, and belladonna, but, as mentioned, with negative results. Without further ado, the patient was put to bed and subjected to a strictly liquid diet, especially of milk. Sparteine sulphate, in doses of half a grain (0.03 grammes) every four hours, was administered at first. After two days the patient felt somewhat but not much better; pulse still weak and irregular, about 162; respiration, 34. She was now passing from twenty-eight to thirty ounces (718 to 855 grammes) in the course of the day. Increased the sparteine to half a grain (0.03 gramme) every three hours on Tuesday morning. On Thursday I found decided changes; breathing more easy, 26 respirations a minute; pulse fuller and stronger, 128 a minute; urine had increased to thirty-eight ounces (1,080 grammes) a day. Friday—pulse, 102; respiration, 24; no dyspnoea; amount of urine in the course of the day, forty-eight ounces (1,370 grammes); appetite much better and sleep more

refreshing; patient more cheerful, with a desire to get out of bed. A week later, the change in the patient's condition was remarkable. Both respiration and pulse apparently normal; the former, 22; the latter strong, fuller still, and only 88 a minute; amount of urine now varied from fifty to seventy ounces (1,925 to 1,995 grammes) a day, the fluid being practically normal; no albumin; acid reaction; specific gravity, 1.022. The thyroid gland was distinctly lessened in size, and the prominence of the eyeballs had apparently disappeared. Appetite almost ravenous; condition of the bowels practically faultless. The patient had become extremely cheerful and, to use her own words, "felt all over like a new person." She was allowed now to get out of bed and instructed to do light bodily exercise. The drug was suspended for several days, during which time the patient did not feel very well; but she continued to improve on the readministration of the medicament, which was ordered in doses of a quarter of a grain (0.015 grammes) three times a day. In the course of about four months the ninety-two-pound girl made the scale mark one hundred and twenty pounds. I lost track of the patient shortly afterward, but two years later I heard that she had been married and become a happy mother.

I do not think it is necessary for me to detail other cases of disease characterized by circulatory changes, and in which sparteine has, in my hands, rendered signal service. The cases I have given fairly represent the main results obtained by me with this valuable drug, destined, if not entirely to replace digitalis, at least to rival it in the treatment of heart affections, or in that of other maladies complicated with serious cardiac disturbances. As already stated, my own experience corroborates also that of other observers in regard to the diuretic properties of the drug under consideration. I could cite several cases of cardiac and renal dropsies in which sparteine, used from the start, gave excellent results as a diuretic, and still other cases that have been greatly benefited by this remedy, cases in which

medicinal agents like digitalis, strophanthus, and others of the same class, tried first, had failed to do any good. But I desire to reproduce here, instead of any number of my own cases, two that have been kindly furnished me by Professor James Tyson, of Philadelphia, illustrating in a striking manner the diuretic properties of sparteine. In this connection I wish to thank my distinguished former teacher for his valuable assistance. Professor Tyson's cases are as follows:

CASE V. *Chronic Parenchymatous Nephritis*.—Mrs. L., aged twenty-three years, was admitted to my wards in the Hospital of the University of Pennsylvania, August 23, 1893. She presented all the symptoms of chronic parenchymatous nephritis—dropsy, pallor, large albuminuria, numerous dark granular casts; also pale granular casts, and many compound granule cells. She was treated with caffeine citrate, digitalis, and sparteine at different times with varying results, all remedies being more or less efficient. With a view, however, to systematically testing the sparteine she was put on the drug after a suitable interval had elapsed, in doses of a quarter of a grain every two hours, on February 18, 1894. During the twenty-four hours previous the secretion of urine had been thirty ounces, and had ranged from a minimum of twenty-nine ounces to a maximum of thirty-eight ounces a day for eleven days preceding. On the 19th, the twenty-four hours' secretion was forty ounces; on the 20th, sixty-four ounces; on the 21st, fifty-nine ounces; on the 22d, seventy-five ounces; on the 23d, sixty ounces. For three days there appear to have been no measurements, when, on the 26th, the twenty-four hours' secretion was fifty-four ounces; on the 27th, fifty-seven ounces; on the 28th, sixty ounces; on the 1st of March, seventy ounces; on the 2d, seventy-seven ounces; on the 3d, seventy-nine ounces; on the 4th, eighty-four ounces; on the 5th, eighty-six ounces; on the 6th, seventy-eight ounces; on the 7th, seventy-nine ounces; on the 8th, ninety-eight ounces; on the 9th, ninety-six ounces; on the 10th, eighty-eight ounces; on the 11th, ninety-four ounces; on the 12th,

ninety-three ounces; on the 13th, eighty ounces. On the 13th of March the sparteine was omitted, and on the 14th the urine had fallen to seventy ounces; on the 15th, to sixty ounces; on the 16th, to fifty-nine ounces; on the 17th the urine was again seventy-two ounces; on the 18th, seventy-nine ounces; and on the 19th it was once more only sixty-five ounces; on the 20th, sixty-two ounces; on the 21st, thirty-nine ounces. On the 22d the urine had arisen to sixty-nine ounces, but on the 23d it again fell to fifty-eight ounces. Thus it will be seen there was a direct relation between the administration of the sparteine and the secretion of urine, the latter increasing when the former was exhibited, and falling when it was discontinued.

CASE VI. *Albuminuria*.—Dr. W. R. B., aged thirty-four years. Three years ago—that is, about January, 1891—albumin was discovered by a medical examiner for a life insurance company, having been previously unsuspected. No other symptoms appeared until about a year ago, when the patient began to have a little shortness of breath on exertion. In the summer of 1893 he went to Omaha to practice medicine, but found on arriving there that he could not sleep. He therefore returned to Philadelphia early in August and began to practice there. Soon after this, however, he had a convulsion, but recovered, and improved greatly for a time under the care of Dr. Robinson, of Camden, N. J. He again grew worse and sent for me on January 11, 1894. I found him gasping for breath, begging for something to make him sleep. His heart was exceedingly feeble, pulse scarcely perceptible at the wrist, but there was no murmur. On examining his urine I found a very large albuminuria, equaling three fourths of the bulk of the urine tested. There was also a large number of casts, hyaline and dark granular, with compound granules also free and adherent to casts. Sleep was obtained by chloral at first, but later morphine became necessary. He was put on the use of strychnine, with caffeine citrate at first, then digitalis, until the effect of these remedies ceased to be obtained. In the meantime the dropsy continued to increase until the skin of his legs burst, and there was constant weeping of serum, while there was also a large abdominal effusion. Spar-teine sulphate was commenced on the 20th of February, when

he was passing but a few ounces of urine and the dropsy was extreme. On the 23d four half-grain doses of sparteine were taken and the twenty-four hours' urine amounted to one hundred and three fluidounces. On the 24th, with three doses, the twenty-four hours' urine equaled seventy nine ounces; on the 25th, with four doses, sixty-one ounces; on the 26th, with three doses, seventy-nine ounces; on the 27th, with three doses, fifty-eight ounces; on the 28th, with one dose, forty-three ounces; on March 1st, with four doses, forty-nine ounces; on the 2d, with four doses, eighty-nine ounces; on the 3d, with three doses, forty-six ounces; on the 4th, with four doses, eighty-three ounces; on the 5th, with two doses, fifty-four ounces. On March 6th no sparteine was given, and the twenty-four hours' urine fell to thirty-two ounces. On the 7th, with four doses, the amount of urine in the twenty-four hours was sixty-four ounces; on the 8th, with one dose, sixty-eight ounces; on the 9th, with one dose, forty-eight ounces; on the 10th, with three doses, eighty-two ounces; on the 11th, with three doses, sixty-four ounces. On the 12th no sparteine was given, and the urine fell to thirty-eight ounces. On this day a small abscess in the leg was opened, which was recognized after the oedema had disappeared. By this time also the abdominal effusion had likewise disappeared. On the 13th no sparteine was administered, and the twenty-four hours' urine only measured twenty-six ounces; on the 14th, no sparteine, with the same result—that is, only twenty-six ounces of urine. On the 15th, the urine having fallen rapidly, sparteine was recommenced; two doses were given with only eighteen ounces in the twenty-four hours. On the 16th, with three doses, twenty-nine ounces; on the 17th, with three doses, twenty-six ounces; on the 18th, with six doses, twenty-seven ounces; on the 19th, with four doses, fourteen ounces. It was now concluded that sparteine had lost its effect, and digitalis was substituted in doses of fifteen minims every four hours. Simultaneously with the marked reduction in the amount of urine it was remarked that the shortness of breath returned in a troublesome way. At the end of the twenty-four hours after the digitalis was commenced the urine had attained fifty-one ounces. At the end of the next

twenty-four hours, terminating at five o'clock on March 22d, with three doses of digitalis, the urine was sixty-eight ounces.

The results obtained in these two highly interesting cases speak for themselves. Dr. Tyson, whose authority in kidney disease is recognized the world over, is a firm believer in the diuretic properties of the drug. Referring to the two cases just described, he writes me as follows:

"I give you these cases without comment; but you will be able to see a markedly direct relation between the administration of the drug and the secretion of urine, notably increased with its exhibition and diminished with its withdrawal, although in Mrs. L.'s case, after the last withdrawal of the drug, the secretion fell to a less degree. I take it that when this happens the kidney is resuming its function. In the doctor's case, however, there followed not only a fall, but also a failure finally to respond, while the substitution of digitalis was promptly followed by an increase. It is, of course, necessary for the drug to have something to work on—that is, there must be fluid in the tissues or in some one of the serous cavities. In one instance I gave it to a young woman with astonishingly scanty secretion of urine, but no dropsy, but it was apparently without effect. Here, after a time, the freer ingestion of water was followed by a corresponding secretion. From the clinical aspect I am inclined to place it after digitalis, although I am not quite certain of this. You will note that I give larger doses than are recommended in the books—say, a quarter of a grain every two hours, or half a grain every four."

I need only add that I entirely agree with the views expressed by Dr. Tyson. There is scarcely any doubt but that sparteine, to exercise its diuretic action to better advantage, requires a suitable field. I myself, for experimental purposes, have taken the remedy with evidently negative results as regards an increase in the amount of urine secreted.

The same Dr. Tyson\* reported not very long ago a

\* *Loc. cit.*

case of albuminuria occurring in a man forty three years of age, in which the effects of sparteine as a diuretic were so striking that I will quote a portion of the details of the case. The author states:

"He was passing about forty ounces of urine. . . . I now (September 8th) added to this treatment sparteine in doses of half a grain three times a day. It will be remembered that this drug had previously been given without effect, not, however, in connection with an exclusive milk diet, which was continued in the quantity of about forty-two ounces daily. It again appeared without effect, and on the 14th was substituted by the infusion of digitalis. The quantity of urine ranged from thirty-two ounces to forty-four until the 25th, when it rose to fifty-five ounces, and continued to rise with fluctuations until sixty-nine ounces were reached. Then there was some diminution, but the quantity continued free until about the 1st of November, when it began to decline until November 15th, when but twenty ounces were passed. Sparteine was again resorted to, and at once the urine rose rapidly and remarkably. Thus on the 16th there were twenty ounces; on the 17th, thirty-three; on the 18th, forty; on the 19th, fifty; on the 20th, seventy; on the 21st, one hundred and twenty-eight; on the 22d, one hundred and sixty-nine; on the 23d, one hundred and fifty-five; on the 24th, one hundred and fourteen; on the 25th, one hundred and forty eight; on the 26th, one hundred and forty-nine. On the 26th the drug was discontinued, when at once there began a fall, the quantity being, however, still free."

Of the large number of prominent practitioners to whom I wrote requesting them to furnish me with their individual experience in the use of sparteine, the majority of them had little or nothing to say in regard to the matter, owing to their having employed the medicament to a limited extent or not at all. Those who have had some clinical experience with the drug kindly reported their observations to me, and I take pleasure in inserting their replies. I wish to thank all these gentlemen for their courtesy.

Dr. William Osler, of Baltimore: "I rarely now use sparteine. Some years ago I tried it in a series of cases of failure of compensation, and usually had to resort to digitalis. It has been in my hands very much inferior to either digitalis or strophanthus. I still occasionally order it when from any cause digitalis is not well borne and strophanthus fails."

Dr. Wharton Sinkler, of Philadelphia: "I have used sparteine in several cases of kidney disease where there was considerable suppression of urine, and was under the impression that its diuretic effect was decided. In one case which I recall I gave it hypodermically in doses of half a grain every four hours, and there was a marked increase in the amount of urine passed; but I did not observe any appreciable influence upon the pulse; in fact, there could be no fair test made of its action upon the heart, as I was giving strychnine at the same time."

Dr. J. M. Anders, of Philadelphia: "(a) *In Acute Renal Affections.*—In acute Bright's disease or acute nephritis with dropsey, it aggravates the local symptoms during the acute or febrile stage; but, after the acute stage is over, its use is followed by polyuria and rapid subsidence of the dropsical swelling. In these cases the commencing dose should be small (an eighth of a grain every four hours), gradually increasing to half a grain. In such instances I have found it to be a powerful diuretic. (b) *In chronic nephritis* (parenchymatous), with dropsey, its employment has not, in my hands, been followed by striking results. It is better to excite first vicarious elimination through the skin and bowels; then sparteine sulphate, in combination with strychnine sulphate and digitalis, may be employed at intervals, with marked increase in the volume of urine, without unpleasant effects. It is, in my opinion, based on practical observation, a feeble cardiac stimulant and tonic. (c) *Organic Disease of the Heart.*—I have notes of some dozen cases of organic valvular disease in which the remedy gave good results, though always most benefited when combined with a powerful cardiac tonic, as digitalis. The cardiac dilatation is not improved by sparteine alone, whereas it is by digitalis; but the diuretic action of the latter drug is augmented by the use of the former in most cases. To overcome arrhythmia it is not as efficient as strophanthus and

digitalis in combination, though it has some effect in this condition. In exophthalmic goitre I have had a limited experience with the drug, and, on the whole, favorable. How best to administer it in this latter disease I do not know precisely. It must, however, have an influence upon the vaso-motor nerves."

Dr. John V. Shoemaker, of Philadelphia: "I have found this remedy useful as a cardiac and renal stimulant. The cases in which I have employed it have been relieved or benefited according to the nature and stage of the disease. It possesses a decided advantage over digitalis in being free from a cumulative action. Although it has been denied that digitalis exerts such an influence, I am satisfied from my observations that, in certain instances, an effect due to accumulation does occur when digitalis has been administered steadily. After a patient has taken sparteine for several weeks it may be discontinued for several days, during which time it will be found that its characteristic effects are maintained. These properties render it extremely valuable for prolonged administration in chronic cases. I have given sulphate of sparteine with advantage in cases of enfeebled cardiac action from organic lesions, and also where the innervation of the organ was markedly disturbed. It is especially beneficial in disease of the mitral valve. In advanced stages of this condition, when dilatation has begun, when the ankles become edematous, respiration embarrassed, and the kidneys inactive, I have witnessed marked relief follow the exhibition of sparteine. The action of the heart has become more steady and forcible, an augmented flow of urine has taken place, and the dropsy has lessened. Sparteine is of service in cases of dyspnoea, palpitation, and cardiac debility arising from an excessive deposit of fat around the heart. This is a frequent occurrence in obese individuals, and may be associated with actual fatty degeneration. These patients are subject, after moderate exertion, or in consequence of digestive disturbance, to paroxysms of breathlessness and palpitation, which are very distressing and which excite great alarm in the subject of the attack. Speedy relief follows the use of sparteine in such cases. In dilatation from valvular disease I often give the remedy hypodermically. Good results follow the use of this remedy in func-

tional diseases of the heart caused by excessive bodily or mental labor, anxiety, etc. It has proved useful likewise in the treatment of tobacco heart. As sparteine increases the elimination of urea, it is beneficial in chronic parenchymatous nephritis, being efficient in reducing the dropsical effusions and in preventing the accumulation of urea in the blood. I have frequently, in such cases, maintained the use of sparteine systematically for a considerable period with decided benefit, and without witnessing any ill effects upon the digestive functions. In short, I consider the sulphate of sparteine an excellent drug in any form of oedema of cardiac or renal origin."

Dr. Roland G. Cortin, of Philadelphia: "It has the effect of increasing vascular tension, which makes it inapplicable in degenerative weakness of the cardiac walls; it is also injurious in obstructive pulmonary diseases—such as pneumonia, hypostatic congestion, etc. It is not as good a diuretic as digitalis or strophanthus or caffeine and some other cardiac tonics. In some cases it seems to act as a diuretic, other times no such action is noticed, and still even frequently it diminishes the quantity of urine. It is rather slow in its action and the effects are rather evanescent, requiring more frequent dosage than some of the tonic medicines usually used for the heart. It can be used hypodermically better than some other like remedies. It is usually well borne by the stomach, better so than digitalis or strophanthus. Eichhorst says that sparteine sulphate stands low in the list of heart tonics and that it seems particularly applicable in cases of cardiac asthma."

Dr. John E. Bacon, of Sumner, Wash.: "I have used sparteine sulphate in a number of cases of functional cardiac disturbances from overuse of tobacco, with the utmost satisfaction, the drug producing a firm, regular contraction after a few doses of a fourth of a grain each, and invariably slowing the normal number of pulsations per minute. I have used the drug in but two extraordinary cases. From clinical observations and from some experiments that I have been conducting, I believe sparteine to be superior to any drug in common use as a prompt stimulant."

From the foregoing clinical evidence it is seen, then, that sparteine is a medicament of considerable power as a

cardiac and renal stimulant, second only, it appears, to digitalis. It is adduced also that sparteine possesses the peculiar advantage of not exerting a cumulative action, although one observer, Bruen,\* believes that it has such an action.

I think it would be unnecessary for me to offer any explanations as to the manner in which the drug under consideration acts in the diseased conditions mentioned. Its direct physiological influence on the heart, and its power to enhance the activity of the kidney as a result of the general increase of the blood-pressure produced by the agent, are sufficiently clear.

Sparteine does not produce, as a general rule, any alarming ill after-effects. In all the literature at my command I have found recorded only a few cases of poisoning caused by the drug. One case † was that of an old woman who, after taking a decoction of the tops and seeds of scoparius, vomited and sweated profusely, staggered, and suffered from disturbance of vision. Another case is reported by Prior ‡ in which, after a dose of thirty grains, arrhythmic action of the heart, nausea, giddiness, and a sense of weight in the limbs, were noticed. A third case is published by Bruen,§ who observed paresis, amounting to paralysis, following the use of the remedy. It is true, again, that Legris, quoted by Wood,|| states that headache, vertigo, palpitations, and tingling in the lower extremities were observed after large doses, and that Garand △ affirms to have noticed loss of motor power in the lower extremities, redness of the face, and cardiac pain,

\* *Loc. cit.*

† *Lancet*, p. 668, October, 1884; also quoted in *Nation. Dispens.*, 1894. ‡ *Edinb. Medical Journal*, xxxiii, 567.

§ *Loc. cit.*

|| *Loc. cit.*

△ *Thèse* 218, Lyon, 1886.

following the ingestion of the drug. All these symptoms, however, have not been necessarily alarming, much less fatal.

The medicament is perhaps best given by itself, though it may be advisable sometimes to administer it in combination with other remedies. In this connection it may be well to bear in mind the idea of incompatibility. I find that Julliard \* calls attention to the fact that sparteine and iodide of sodium are incompatible.

Another important point is that of dosage. In this matter authors differ materially. Thus Sée puts down the dose of sparteine as two grains (0.13 gramme) a day; Prior, from a sixth to a third of a grain (0.01 to 0.02 gramme) several times a day; Clarke gave it in amounts of a sixteenth of a grain (0.004 gramme) every four hours, and increased it to twelve grains (0.78 gramme) a day without causing toxic effects. Gluzinski recommends the remedy in doses of from a third to three quarters of a grain (0.02 to 0.04 gramme), while Levaschew has given it in from a grain and a half to four grains and a half (0.09 to 0.29 gramme) three or four times a day. As has been noticed, Tyson employs it also in comparatively large quantities—that is, a fourth of a grain (0.015 gramme) every two hours, or half a grain (0.03 gramme) every four hours. I myself have given sparteine in as high doses as half a grain (0.03 gramme) every three hours. I believe in this energetic method of administration. There is no doubt that large quantities must be used in order to insure the good effects of sparteine; small doses generally lead to disappointment.

1320 AVENUE E.

\* *Journ. de méd., de chirurg. et de pharmacologie*, July 20, 1891.

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